

SECTION 432216

AGITATORS

PART 1 – GENERAL

101. EXTENT

- 101.1 This Section prescribes the minimum requirements for the design, manufacture, testing, furnishing, delivery and installation of agitators as specified below, complete with integral components. The CONTRACTOR shall conform to the requirements of this Section and to the requirements indicated on the design drawings.
- 101.2 CONTRACTOR shall provide, but not necessarily be limited to, design, fabrication, and delivery of the agitators and accessories, and providing the services as delineated in this specification.
- 101.3 Top-mounted agitators shall be furnished to promote mixing, and maintain suspension of the tank/sump contents. The agitators shall be helical or spiral-bevel gear driven.
- 101.4 The agitator provided shall include:
- a. A mounting base suitable for connection to structural steel.
 - b. Auxiliary piping as required for flushing.
 - c. Other equipment and material as required to provide a complete unit.
- 101.5 The CONTRACTOR shall provide all the required installation and commissioning materials.
- 101.6 Each agitator and its appurtenances and accessories shall conform to the requirements of this Specification and shall satisfy all conditions and requirements set forth in this specification.

102. DESIGN REQUIREMENTS

- 102.1 Agitators shall be designed for continuous operation.
- 102.2 Agitators shall be sized to re-suspend settled solids in tanks and sumps within 2 hours after a 24-hour shutdown.
- 102.3 Agitators shall be designed to achieve uniform suspension in at least 50% of the liquid height and maintain solids suspension when liquid level is no more than 25 percent of tank height.
- 102.4 Agitators shall be oriented to prevent solids buildup on the bottom of the tank/sump.
- 102.5 The motor, gear reducer, and agitator shall be supplied on a common base fabricated of steel or cast iron of rigid construction to maintain alignment of all components.
- 102.6 After extended outages flush water shall be introduced to agitate packed solids prior to starting the agitator. Flush water shall be introduced through supplied 2-inch hose connections located at each agitator.
- 102.7 CONTRACTOR shall provide tank baffles to prevent vortexing and to provide adequate mixing. CONTRACTOR shall consult with the agitator supplier to determine if tank baffles (supplied by CONTRACTOR) are required for proper vertical flow distribution.

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Specification G-5301

Issue: Client Comments, Rev. 3

September 8, 2011

Project No. 12681-006

102.8 Noise Level

The warranted maximum sound level at any operating condition shall not exceed 85 dBA (re: 0.0002 microbar) at any point one meter from the agitator (complete with all associated equipment including motor drive supplied to meet this specification) in accordance with ANSI Standard S1.13.

103. REFERENCE DOCUMENTS

103.1 Standards, specifications, manuals, codes and other publications of nationally recognized organizations and associations are referenced herein. Methods, equipment and materials specified herein shall comply with the specified and applicable portions of the referenced documents indicated in Section 014219, in addition to federal, state or local codes having jurisdiction. References to these documents are to the latest issue date of each document, unless otherwise indicated, together with the applicable additions, addenda, amendments, supplements, thereto, in effect as of the date indicated in Section 014219.

103.2 AGMA - American Gear Manufacturers Association

103.3 HI - Hydraulic Institute

103.4 ASME - American Society of Mechanical Engineers

103.5 Boiler and Pressure Vessel Code, Section VIII, Division I - Pressure Vessels

103.6 AISI - American Iron and Steel Institute

103.7 ANSI - American National Standards Institute, Inc.

103.8 ASTM - American Society for Testing and Materials

103.9 AWS - American Welding Society

103.10 AWWA - American Water Works Association

103.11 ISO - The International Organization for Standardization

103.12 NEMA - National Electrical Manufacturers Association

103.13 UL - Underwriters' Laboratories

PART 2 - PRODUCTS

201. COMPONENTS

201.1 General:

- a. If horizontally mounted agitators are required, CONTRACTOR shall give careful consideration to shaft sealing and shaft support. Mechanical seals are preferred.
- b. Where specified herein, or where required by CONTRACTOR, top-mounted agitators shall be furnished to promote mixing, maintain a uniform slurry concentration, and maintain suspension of the tank contents.

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- c. Equipment shall be suitable for operation based on the location where installed and associated ambient conditions as specified in Section 011100.
- d. All wetted components of the agitators shall be elastomer coated and spark tested, unless constructed of appropriate, approved alloy material. Coating shall be a minimum of 1/8 inch thick on the shaft and 1/4 inch thick on the impeller with 1/4 inch build-up on leading edges and areas of high wear.

201.2 Gear Drive and Shaft

- a. Reducing drive gears shall be designed in accordance with American Gear Manufacturers Association Quality Rating 10 gearing. All exposed rotating drive equipment shall have guards meeting OSHA requirements.
- b. The drive and shaft shall have anti-friction bearings throughout and shall be designed for the maximum possible loads from fluid agitation, including torque, thrust, and unbalanced hydraulic load. Bearings shall have a minimum ANSI/AFBMA L10 life of 150,000 hours.
- c. All agitators shall be either right-angle or parallel shaft gear drive. Belt drives are not acceptable. Agitators shall have a right angle drive with appropriate gearing and oil splash lubrication. Oil pumps shall not be used. Gear speed reducers shall have a minimum AGMA service factor of 1.5 based on motor nameplate horsepower. Gear speed reducer maintenance shall be possible without motor removal.
- d. The agitator shaft diameter shall be sized for two times the calculated diameter. Agitators shall be suitable for operation at all tank / sump liquid levels from minimum submergence to top of tank / sump levels.
- e. CONTRACTOR is responsible for conformance with the minimum wall thickness requirements of the applicable codes and standards for shafts. CONTRACTOR shall also be responsible for inclusion of corrosion allowances into wall thickness on agitators.
- f. Agitators shall not use steady bearings within the tank. Where there is no other alternative to this practice, CONTRACTOR shall clearly state where agitator steady bearings are used and obtain written approval from the DISTRICT.
- g. The agitator assembly shall be equipped to permit speed change. The change gears shall be accessible without disassembling the inner parts of the drive.

201.3 Impellers

- a. CONTRACTOR shall design all agitator tip speeds low enough to be suitable for the intended service. Tip speeds and shaft speeds shall be based on CONTRACTOR's successful experience at operating FGD systems.
- b. Impellers and impeller shafts shall meet the following requirements:
 - b1. Impeller thrust shall not be transmitted to the motor.
 - b2. Flow patterns from the impeller shall be capable of maintaining solids in suspension with and without recirculating flow from the tank.

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- b3. The impeller and shaft shall be easily removable from inside the tank without disturbing the speed reducers or the motor.
- b4. Impellers shall not be integrally welded to the shaft.
- b5. Shaft sleeves shall be of a material with superior corrosion resistance.

201.4 Lubrication

- a. Lubrication of the agitator speed reducer shall be by means of oil bath or oil splash to ensure constant flow of oil to all gear surfaces. A positive means shall be provided to prevent oil leakage into the slurry.
- b. A dipstick and sight glass shall be provided to check oil level. A low level switch shall be provided.

201.5 Electrical Requirements:

See Section 260000.

PART 3 – EXECUTION

Not Used

END OF SECTION 432216

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